COASTAL FISHERIES PROGRAMME
NEARSHORE FISHERIES DEVELOPMENT AND TRAINING SECTION

Techniques to reduce bycatch of endangered species

Bycatch has become an increasingly prominent issue in commercial tuna fisheries of the western and central Pacific Ocean in recent years. Increased observer coverage has resulted in a better understanding of the nature of interactions between these fisheries and both protected species and other species of concern. Sea turtles, seabirds and cetaceans are some of the animals currently attracting the greatest concern, primarily because they take a long time to mature, are long-lived, and produce relatively few offspring. For the same reasons, increased attention is also being paid to shark bycatch in commercial tuna and swordfish catches. Certain management measures that are, or soon will be, in force have been established by the Western and Central Pacific Fisheries Commission regarding the mitigation of bycatch. These measures will have an impact on vessels fishing in the SPC region, including domestic and domestic-based fleets.

Over the years, SPC's Nearshore Fishery Development and Training Section has been involved in bycatch awareness and mitigation, including the provision of workshops for the commercial tuna industry, publication of booklets on protected species, and the production of a variety of bycatch awareness materials for both artisanal and commercial fisheries.

A workshop was convened by the Nearshore Fishery Development and Training Section to improve the capacity of training institutions and fishery departments in the SPC region. The purpose of the workshop (which ran from 8–12 June) was to enable participants to deliver awareness programmes to their local fishing industries, and to develop a specific training module on bycatch to be included in the development of new training courses in the future. Workshop participants came from Cook Islands, Fiji, French Polynesia, Kiribati, New Caledonia, Solomon Islands, Palau and Papua New Guinea. The workshop was conducted by Hawaii-based consultant Mike A. McCoy of Gillett, Preston and Associates. Three members of SPC's Oceanic Fisheries Programme gave presentations. Peter Williams provided an overview of the collection and use of bycatch data, and spoke on the importance of collecting such data. David Kirby gave an overview of the Oceanic Fisheries Programme's ecological risk assessment project for bycatch monitoring that is being undertaken for the Western and Central Pacific Fishery Commission's Scientific Committee. Peter Sharples gave a presentation on observer activities related to bycatch, and provided insights into bycatch-related observer activities.

In addition to the specific presentation by SPC-based experts, topics covered during the week-long workshop included:

- a brief overview of the aspects of commercial tuna fishing methods most relevant to bycatch;
- why avoiding bycatch is important (both from biological and economic points of view);
- current national legislation and regional and international instruments that govern bycatch practices by fishers;
- estimates of bycatch levels in the western and central Pacific commercial tuna fisheries (longline and purse seine);
- methods and gear configurations that can mitigate bycatch interactions;
- methods and tools to mitigate mortality in certain species caught incidentally to fishing operations;
- the importance of collecting and recording bycatch data onboard; and

Mike McCoy shows how to use a de-hooker to Mbwenea Teioki from Kiribati

- an example of a required protected species workshop designed for longline fishing operators.

During the last day and a half of the workshop, participants from fishery management administrations devised a brief outline of course content for a standardised Pacific Islands bycatch workshop that could be used as the basis for the development of more detailed workshops at the national level. Participants from training institutions created individual approaches to a bycatch training module that will be taken forward by SPC to develop a regional training module to provide basic knowledge and skills in bycatch mitigation. Each participant also created a short plan on how these activities could be implemented at the national level.

Samol Kanawi and Manoi Kutan, from Papua New Guinea, watch Marie Yonger, from French Polynesia, learning how to use a de-hooker...using cardboard.

Hook exchange project in Cook Islands reduces sea turtle bycatch

Concerns about the high numbers of sea turtles caught by Rarotonga's domestic longline fleet have resulted in a hook exchange project. Cook Islands' domestic longline fleet, which targets mainly swordfish and bigeye tuna, was catching sea turtles at an unsupportable rate, and concerns were raised that efforts needed to be taken to mitigate the capture and post-capture mortality of these turtles. During the project, a loggerhead turtle was caught by a domestic longline vessel and released alive. Interviews with boat captains revealed that, although the Cook Islands Ministry of Marine Resources (MMR) had no data on turtle bycatch for the domestic fleet, turtle interactions were not uncommon. In fact, since 2007, there have been three more observed turtle interactions (one each of loggerhead, hawksbill, and leatherback) with the domestic fleet, all during 2009. This is particularly alarming considering that the fleet was down to only three vessels when these interactions were reported. Two of the turtles were released alive but the leatherback died. All three turtles were hooked in the mouth.

Subsequently, it was decided to organise and conduct a hook exchange project with vessels in Rarotonga's domestic-based longline fishery. The project was a collaborative effort, with inputs from MMR and the Pacific Island Fisheries Science Center (PIFSC), which is part of the US National Marine Fisheries Service. More specifically, the project's objective was to conduct an experiment using large circle hooks in the Cook Islands domestic longline fishery to determine whether or not their use would mitigate bycatch catch rates while not affecting target species catch rates. SPC and PIFSC organised and initiated the experiment, while MMR carried on with the experiment for a specific time in order to capture a robust data set.

PIFSC subsequently donated 16,000 16/0 stainless steel offset, non-ringed circle hooks to be used in the project. SPC, using funds secured from the Pacific Islands Forum Fisheries Agency (FFA), purchased all ancillary gear, including bench crimpers, sleeves, protective tubing and monofilament for the branchlines. MMR provided assistance in setting up the project (Pam Maru was selected as project supervisor) and provided a vehicle for the initial phase of the project while SPC and PIFSC were present in Rarotonga.

During the project's first week, half of the gear on the project vessel, F/V *Gold Country* was converted to experimental gear. Although some of the boats in the fleet used Japan tuna hooks and/or Teracima hooks (similar to Japan tuna hooks) exclusively, the F/V *Gold Country* already had a good proportion of circle hooks on their branchlines. In fact, 14 different hook types and sizes were found.

The experimental plan was simple. One half of the hooks normally used on the project vessel were cut off of existing branchlines and replaced by project

Fourteen different hook types and sizes were found among F/V *Gold Country*'s gear.

hooks (16/0 SS offset circle hooks without ring). No other changes were made with the exception that, as hooks were replaced, monofilament was also replaced if damaged. This is a usual practice for longline boats in normal circumstances. Thus, there were effectively two sets of terminal gear — control and experimental. F/V *Gold Country* routinely deploys about 1,500–2,000 hooks per set. The project team made up 1,500 experimental branchlines in three branchline bins, which was sufficient for half the set, plus spares on the first trip and a reserve for subsequent trips. The snaps on all of the experimental gear were spray-painted with blue enamel so that they could be readily distinguished from control branchlines (see Figure).

The SPC/FFA Regional Longline Observer Catch Monitoring Form LL-4 was used to record all catch data. In the blank column, the hook type was recorded as O (control) or X (experimental) so that it was known for every animal caught which hook type it was caught on. All other relevant information was taken on this form. It was decided that the best sequence for setting initially would be OX-OXOX. In other words, control hooks would be alternated with experimental hooks, one to one. The first set and haul operation, however, had operational difficulties resulting from this set up. It was not easy for the crew to keep up with hauling and coiling while having to alternate blue snaps with plain snaps. After the second set it was decided to abandon the alternating hook approach, and allow the branchlines to be returned to the bins in random order. By the end of the trip it appeared that the two types of branchlines were randomly distributed in the branchline bins.

Results of the first trip were very promising. Although the dataset is too small to draw any definitive conclusions, the new hooks caught more fish, including more of the target species, than the control hooks. In total, 9,130 hooks were set during five sets, catching 127 fish of 14 species. Table 1 shows a breakdown of catch by hook type. The X hooks caught 58% of the albacore, 57% of the bigeye tuna and 83% of the swordfish, the three main target species. The X hooks caught 58% of the overall catch. No turtles were encountered.

Table 1. Total fish caught by species on each hook type: O hooks are control, X hooks are experimental.

Species	O hooks	X hooks	Total
Albacore	10	14	24
Bigeye	3	4	7
Skipjack	4	1	5
Swordfish	2	10	12
Striped marlin	0	1	1
Wahoo	1	0	1
Mahi mahi	10	11	21
Snake mackerel	4	14	18
Mora	8	10	18
Oilfish	6	4	10
Blue shark	1	4	5
Pelagic stingray	3	0	3
Lancetfish	1	0	1
Shortfin mako	0	1	1
Total	53	74	127

To facilitate future experiments of this kind, and to aid observers and researchers in identifying hook types used in longline fishing, SPC is producing a booklet titled "Longline terminal gear identification guide". Copies of this booklet should be available in early 2010. The guide will include drawings (to actual size) of all the various hooks used in longline fishing operations in the Pacific.

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Note: Article written with input from Dan Curran, NOAA PIFSC

MMR staff exchanging hooks and painting snaps